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THE DISTRIBUTION OF *HYLA ARENICOLOR* COPE, WITH NOTES ON ITS HABITS AND VARIATION

C. H. RICHARDSON, JR.

STANFORD UNIVERSITY

STUDENTS of zoogeographical distribution are frequently hindered by the scarcity and inexactness of the published data in the particular group which they are studying. Especially is this true of students of western North American amphibians, for they must rely largely upon the publications of the early exploring expeditions in which localities were often stated in a most general way and at times with doubtful accuracy.

Our present knowledge of the distribution of the tree toad, *Hyla arenicolor* Cope, is very incomplete. Many of the references to its occurrence are extremely indefinite and unreliable and in no case has enough material been gathered to give the limits of its range in any one region. It was first discovered and named *Hyla affinis* by Baird¹ in 1854, the description being based upon one specimen from the state of Sonora, Mexico. Later Cope² found this name to be preoccupied and replaced it with *arenicolor*. At the present writing this tree toad is known to inhabit parts of southern California, Utah, Arizona, New Mexico, Texas, and Mexico. Southern California is included in its range on the strength of two specimens collected in 1875 by H. W. Henshaw,³ and no additional records of its occurrence within the state have been made by the herpetologists who have explored this region. Within the last few years, however, the University of California Museum of Vertebrate Zoology has acquired a number of specimens of *Hyla arenicolor* from various

¹ *Proc. Acad. Nat. Sci. Phila.*, p. 61.

² *Journal Acad. Nat. Sci. Phila.*, 1866, p. 84.

³ Yarrow, *Bull. U. S. Nat. Mus.*, No. 24, 1882, pp. 24, 175.

localities in southern California. Through the kindness of the director, Professor J. Grinnell, the writer has been extended the privilege of examining these specimens and the results are incorporated in the present article. Specimens from the following localities have been studied, all of which are in the Museum of Vertebrate Zoology unless otherwise stated.

TABLE A

No. of Specimens	Locality	Altitude	Date	Collector
8	Mountain Spring, San Diego Co., Cal.	About 4,500 ft.	1909 Mar. 25	F. Stephens
1	La Puerta, San Diego Co., Cal.	About 4,500 ft.	June 5	F. Stephens
1	Warner's Pass, San Diego Co., Cal.	4,000 ft.	June 22	F. Stephens
1	Julian, San Diego Co., Cal.	3,750 ft.	July 29	F. Stephens
3	Pine Mt., near Escondido, Cal.	2,750 ft.	1906 Sept. 4	J. Dixon
1	Carrizo Creek, Santa Rosa Mts., Cal.	3,000 ft.	1908 June 22	J. Grinnell
2	Dos Palmos Springs, Santa Rosa Mts., Cal.	3,500 ft.	May 26	J. Grinnell
9	Deep Canyon, Santa Rosa Mts., Cal.	3,000 ft.	June 21	J. Grinnell
1	Lower Palm Canyon, San Jacinto Mts., Cal.	800 ft.	June 15	J. Grinnell
2	Oak Springs, upper Palm Canyon, San Jacinto Mts., Cal.	4,750 ft.	June 11	J. Grinnell
4	Base of San Jacinto Mts. near Cabazon, Riverside Co., Cal.	1,700 ft.	May 5 and 7	W. P. Taylor and C. H. Richardson Jr.
4	Sierra Madre, Los Angeles Co., Cal.	1,500 ft.	May, 1904	J. Grinnell
20	Arroyo Seco Canyon near Pasadena, Cal.	1,500 to 2,000 ft.	1903 Aug. 3 and 23	J. Grinnell
1	Tejunga Valley, Los Angeles Co., Cal.	About 1,500 ft.	1910 Apr. 1	J. Grinnell
1	(Stanford University coll.) Upper Santa Anita Canyon, Los Angeles Co., Cal.	3,500 ft.	Aug. 7	C. H. Richardson, Jr.

In California, *Hyla arenicolor* is now known to range northward along the coast mountains from near the Mexican boundary to the Tejunga Valley, Los Angeles County. In San Diego County it occurs on both the coast and desert slopes of the mountains; in Riverside County, on the desert slope, and in Los Angeles County, so far as known, only on the coast slope. No records of its

occurrence in San Bernardino County are at hand, but a careful search will undoubtedly reveal its presence there. Throughout this region, its habitat appears to be confined to streams and mountain springs between 1,000 and 5,000 feet elevation. Here the writer has found it associated with such trees as *Alnus rhombifolia*, *Platanus racemosa*, and *Acer macrophyllum* and in this state at least it may be regarded as an inhabitant of canyons within the upper sonoran zone. It is apparently more strictly aquatic than the smaller *Hyla regilla* Baird and Girard, whose range in southern California is, in part, coextensive with it. The former species has never been found far away from the vicinity of water, while the latter has often been seen under vegetation a considerable distance from it.

The following meager notes indicate that the breeding season of *Hyla arenicolor* extends from late spring until fall: Two females from Sierra Madre, Los Angeles County, May, 1904, one from Warner's Pass, San Diego County, June 22, 1909, and one from Pine Mountain, near Escondido, San Diego County, Sept. 4, 1906, contain large eggs. There is also a young specimen from La Puerta, San Diego County, collected on June 5, 1909, in which the tail has not been entirely absorbed.

Miss Dickerson⁴ has described the rapid color changes that take place in this species. The writer noted that a light-colored individual which was captured on a granite rock changed to a dark gray mottled with lighter markings when placed for a short time in a covered tin pail.

The widely scattered record stations given below, some of which are too inexact to be of great value, suggest that *Hyla arenicolor* lives in suitable places over practically the entire southwestern part of the United States and a considerable portion of the Mexican tableland as well. Little has been written concerning its habitat preferences within this region. Stejneger⁵ has found it in the Grand

⁴ The Frog Book, Doubleday, Page and Company, 1906, p. 122.

⁵ N. A. Fauna, No. 3, 1890, p. 117.

Canyon of the Colorado, Arizona, at an elevation of 1,000 feet above the river and in the bottom of the canyon. Ruthven's⁶ specimens from Sabino Canyon, Santa Catalina Mountains, Arizona, were "found among bushes on the floor of the canyon" in the "willow-poplar association."

TABLE B

No. of Specimens	Locality	Date	Authority
1 type	Sonora, Mexico		Cope; Baird
	Guanajuato, Mexico		Duges
	Guadalajara, Mexico		Duges
	Between City of Mexico and Chihuahua, Mex.		Cope
	Valleys of Mexico or Toluca Mexico ..		Cope
1	Del Rio, Texas.		Witmer Stone
2	El Paso, Texas.		Boulenger
1	Santa Fe, New Mexico	June, 1873	Yarrow
1	Fort Wingate, New Mexico		Cope
1	Utah	1872	Yarrow
	Tucson, Arizona		Miss Dickerson
	Upper Colorado River		Cope
	White River Canyon, Arizona.....		Cope
6	Grand Canyon of the Colorado, Arizona	Sept. 3, 1889	Stejneger
	Fort Whipple, Arizona		Cope
2	Sabino Canyon, Santa Catalina Mts., Ariz.	May 23, 1903	Ruthven
2	Southern California	1875	Yarrow

Specimens of *Hyla arenicolor* from southern California agree quite closely with the published descriptions. Cope⁷ states that the diameter of the tympanum is equal to two thirds that of the eye fissure, but in ten specimens measured (see following table) this ratio is shown to be 47.7 per cent., or not quite one half. Boulenger's *Hyla copii*⁸ described from two specimens obtained at El Paso, Texas, and now considered synonymous with *Hyla arenicolor*, has the diameter of the tympanum one half that of the eye fissure, a fact which suggests that this character is subject to considerable variation throughout the range of the species. The ratio between the length of the body and that of the hind limb is also subject to

⁶ Bull. Am. Mus. Nat. Hist., 1907, p. 509.

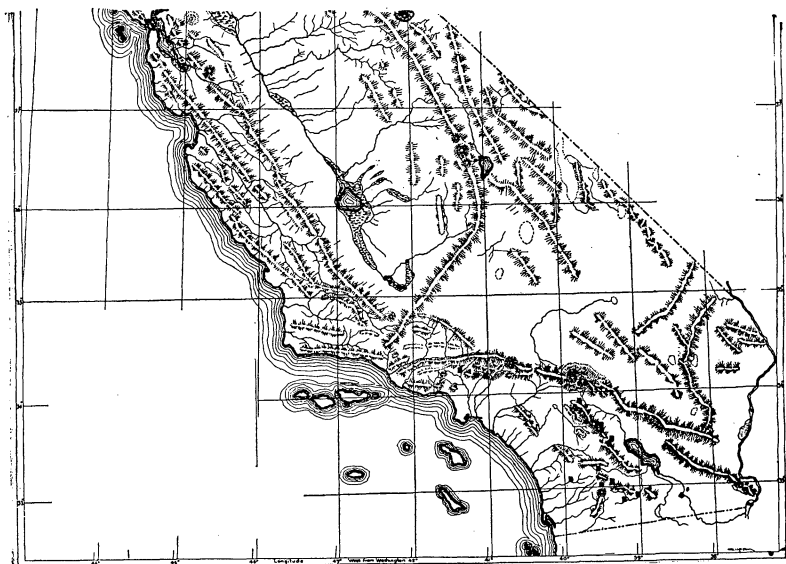
⁷ Bull. U. S. Nat. Mus., 1889, No. 34, pp. 369-370.

⁸ Annals and Magazine Nat. Hist., 1887, p. 53.

TABLE OF MEASUREMENTS (IN MILLIMETERS)

No. (U. C. M. V. Z.)	Sex.	Length Snout to Anus	Width Head at Posterior Angle of Eye	Fore Limb	Hind Limb from Tip of Urostyle	Tibia	Diameter of Tympanum	Diam. of Eye	Ratio Diam. of Tym- panum to Diam. of Eye	Locality
920	♂	35.5	12.5	22.3	57.5	20.	2.5	4.	.625	Sierra Madre, Los Angeles Co., Cal.
977	♂	33.	12.	20.	53.5	18.	1.5	4.	.375	Mountain Spring, San Diego Co., Cal.
979	♂	34.9	13.	19.3	53.	18.	2.2	4.	.55	Mountain Spring, San Diego Co., Cal.
980	♂	33.3	13.2	18.5	50.3	16.5	1.8	4.4	.409	Mountain Spring, San Diego Co., Cal.
976	♂	30.	11.1	18.2	50.	17.	1.6	4.	.40	Mountain Spring, San Diego Co., Cal.
978	♂	33.8	12.6	21.5	55.	18.	2.	4.5	.444	Mountain Spring, San Diego Co., Cal.
922	♀	40.	16.	26.	67.	22.	3.	5.	.60	Sierra Madre, Los Angeles Co., Cal.
921	♀	38.	13.	23.	63.	21.	2.	4.	.50	Sierra Madre, Los Angeles Co., Cal.
929	♀	37.	13.8	23.5	67.	21.5	2.	4.5	.444	Pine Mountain, near Escondido, San Diego Co., Cal.
1037	♀	40.2	15.	25.	70.	22.	2.	4.7	.425	Warner's Pass, San Diego Co., Cal.

pronounced variation in southern California specimens. The heel of the limb when extended forward usually reaches to the anterior border of the orbit,⁹ but in young individuals it often extends to the tip of the snout.



THE DISTRIBUTION OF *Hyla arenicolor* COPE IN CALIFORNIA ACCORDING TO THE LOCALITY RECORDS.

The table also shows that there is a well-marked difference in the size of the sexes, the female being larger, especially in the length of the body and hind limbs.

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⁹ Cope, *loc. cit.*

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